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in this being the most recent exposure, and looking at m the time period during which the greatest exposures procurred, and looking at the significance of the exposure in terms of the height of the bar.

We also have an event and activity summary in output. So for each of those line item entries is a m generation of report which looks at the individual [8] activities and the inputs associated with that, as well as the specifically cited sources.

And then finally we have a reconstruction [10] [11] summary output that looks at the significance of a [12] particular exposure with respect to a product as well [13] as the manufacturer. So through this process we can [14] systematically compile a person's timeline, develop a [15] work history through event, exposure event [16] compilations, and output that information in terms of (17) product type, period of time, or activity that was [18] performed on those individual products.

Well, that is a historic reconstruction. [20] Let's talk about one that is a more contemporary one. [21] In this particular case, an individual was putting in (22) a fire annunciator system and didn't realize that the [23] acoustical plaster that was on the ceiling was pay asbestos-containing. What the individual did was gs, drill holes through the ceiling accidentally, and the

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(1) activity description of drilling the three-quarter inch holes into the ceiling. We knew what the - we pj knew it was a 15 percent chrysotile material. We

m knew that the person was working with the material.

12 by We knew that it took somewhere between 3 and 12 in percent of the day, an 8-hour day, 5 days a week,

m except it was 1 day that this activity occurred.

We referenced back to a specific article m since we weren't there to measure it. This is the ing article that was referenced. Having to do with a in sprayed material, it seemed to be the closest fit to the description of the activity. And here is the [13] link to that specific article.

The calculated dose then from drilling a us hole through the ceiling for the period of time that [15] it was described to have taken was a minimum dose of (17) .000002 fiber years.

[18] With that — when we go back to the first 1191 page where that is shown, it is too small to be able go to be shown in the effective dose, but we were able (21) to do a Monte Carlo analysis on that and demonstrate [22] that based on the inputs, these variable inputs, that [23] the range was between about 6 and 17 to the minus 6 [24] fiber years of dose associated with that specific zs event.

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[1] activity occurred for some period of time, and once 2) it was discovered it was stopped, but nevertheless, p) the individual was very concerned in wanting to know 14) when they were going to develop cancer as a result of is having been exposed.

Now as industrial hygienists, intuitively [6] m we know how to answer that question, but the (8) objective here was to put some science and 91 mathematics behind determining what the dose was of [10] the event.

And we can use the same process to be able [11] pg to do that. We look at the construction incident as [13] an exposure event. So this incident is the exposure [14] event. It was composed of specific activities, in his this case cutting through the ceiling. It was an [16] activity that through interview was determined to in have taken a specific amount of time. However, there was a range associated with the time. Well, I think it was at least this long and I don't think it was 201 any longer than this. That defined the range of the time. [21]

The acoustical plaster was able to be 231 sampled, it actually was inventoried as part of the 24 building record, and so we knew what the material was 25) composed of. We were able to compile then an

This is helpful in being able to 27 communicate the significance of the event. Clearly p) it is not something we want people doing from a [4] preventative standpoint, but when these occur, and is they do occur, there is a mechanism to be able to is reconstruct that event and communicate effectively m with the individual about the significance of the [9] event. We can do a similar summary on that as well 191 as a detailed statistical analysis and a sensitivity not analysis as well to determine whether it is a close [11] fit.

With that, I would like to thank all of pay you for your participation. We have some time for [14] questions and answers. And I appreciate all of you us showing up on the morning to participate in this (is experience.

[17] Are there any questions?

[18] Yes.

MORTON CORN: Would you entenain a (191 gg comment?

FRED BOELTER: Please, Dr. Corn. [21]

MORTON CORN: I am Morton Corn, Professor (22)

[23] Emeritus Johns Hopkins University.

I think there is a very important [24] 129 philosophical component to discussing these

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techniques, and I would like to briefly elaborate on that.

Retrospective exposure assessment had its roots in epidemiologic studies, and I was privileged to be involved in many of those early ones, where we worked with a cohort of workers to address the question, is there a dose response curve, and these studies involved 18,000 workers, 5,000 workers.

We had anchor points for exposure with time in the same facilities, and the challenge was to fill in the missing years and the missing exposures which could be correlated with technological change usually, and that became known as the job exposure matrix and retrospective exposure assessment. And the techniques were extraordinarily useful because they did, indeed, focus on some thresholds where disease was recognized by the epidemiologist. We did have to pool our data into classes to correlate, very low exposure, low exposure, medium, high. The data were not usually good enough for the individual correlation.

What we have been talking about today is 10t that. And I think that is science and is judged is science. We have been listening to that technique eversed in response to the legal arena. We have

een asked to take retrospective exposure for an adividual, not for a cohort, and to use the echniques developed for a cohort to answer questions 1 the legal arena in the dispensing of justice. And 10se questions are to be answered with a more likely ian not, or a high degree of scientific uncertainty ) the individual performing the exposure analysis. nd the question is usually, since the - in the bestos arena, the cohort studies have given us. I elieve, a threshold for fibrosis, and a threshold r lung cancer, and a suggested threshold for esothelioma. We are being asked was the exposure insistent with those guidelines, do we believe the posure could cause the disease, because there is a t of argument about what fibrosis is, and there is ot of argument if the lung cancer is due to loking or to asbestos. So the first question is, is the threshold passed.

Second question we are being asked with : presentations given this morning is what is the ignment of damages, assuming that the disease is : manifestation of the totality of exposure. In doing that, and I think we have heard ne very good utilizations of the exposure essment methodology, but I think we should be

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in aware that not only is this a science and an art, I pthink it is an art and a science. We have drawn on py some of the science to persuade juries or judges of

m the answers to those two questions.

We are using data for individuals not in in those places where they worked. We all know the my variability of the workplace. We have heard some m point estimates which I think we just cannot give.

m The variability is essential to the data we assume. (10) and it is even greater when you realize that data is in not for the establishments for the individuals nz involved.

So uncertainty is absolutely critical in [13] [14] all of this for the integrity of the presentation. I believe some of the methodologies given ពេទា

11st have the capacity to fool us with the specificities 1171 and the readouts of the computer. Bill, for nal instance, is drawing on assumptions that are hot [19] arguments. Fiber type is still not accepted, Bill.

201 And while I would agree with you, you have got a big 21) persuasion argument with the assignment of factors.

Peto's time analysis is still not totally [22]

The bottom line for what I am saying is, gs we are going to be faced in the courtroom with one of

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in us on one side and one of us on the other side [2] presenting these arguments one to the pleasure of the (3) Plaintiff and one to the pleasure of the defense, and [4] the stakes are not only individual credibility but is the credibility of our field. Do not oversell these [6] methods.

I think the progress I listened to here [8] today was superb and I think some of it was literally 191 the state of the art of doing this. But as the not practitioners, we should recognize just how soft much nn of it is and that we are in an arena to persuade.

[12] This isn't science. Thank you.

(Applause.)

FRED BOELTER: Thank you. Do any of the [14] us panelists wish to comment?

ALLEN ROGERS: Allen Rogers from 1161

117 Australia

FRED BOELTER: Excuse me just one minute.

[19] Just a minute. Dr. Fowler is going to have a

[20] comment, thank you.

DOUG FOWLER: Dr. Corn's comments are [22] similar to those that I have made in court under oath 1231 on occasion in that there is always grave uncertainty 241 about attribution of exposure of individuals 40 or 50

pg years ago when the only information about that

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in exposure that we have is the recollection of the [2] individual as prompted by an attorney. And it is clear that we cannot have the same kind of certainty [4] that we have with regard to measurements that we made in yesterday when we are talking about our guesses, and [6] they are guesses, rather than estimates, of what the m exposures were 40, 50, 60 years ago.

So, yes, your comments are entirely apt, [8] [9] Dr. Corn, and I agree with them.

Now, having said that, I will say that [10] [11] this technology that has been shown to us by the [12] other panelists here, the Monte Carlo methods, are [13] very useful in giving figures of merit from which one [14] can make reasonable assumptions about relative risks.

You just have to be awfully careful not to have too

[16] many significant figures, and with asbestos in measurement, maybe one significant figure is about -

maybe two, sometimes, is about all you can hope for. [19] But I agree. But, these techniques will help to

go, focus and to make the argument more pointed.

BILL DYSON: I would certainly agree with [21] [22] what you said, Mort, but I would point out that what 1231 the opposite argument is is that every exposure is

[24] Significant and every exposure is contributory, and gs that just isn't the case always, and we have to have

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in some type of methodology for sorting that out, and 12) the methodologies that have been presented here, at [3] least, are useful in getting us into the appropriate (4) ball game of sorting that out. MORT CORN: What worries me is the 161 difference in the methodologies. It might be best if

m we could set a standard for ourselves that where this B) type of analysis is involved in a case, Plaintiffs [9] and defense experts must agree. I think for the no credibility of our field, if there could be one

[11] assessment that both experts agree on, it would be [12] marvelous.

JIM RASMUSON: All models are wrong. Some are useful, and I think when we can show many orders (15) of magnitude of differences, and I think as Dr. Corn said, when we can be inclusive of both Plaintiff experts and experts for the defense, to the extent possible, I think all of that is going to help, but I think, as I indicated in the talk, recognizing the limitations of the methodology is just as important as recognizing the strengths of the methodology. [21]

(This concludes side 1. Please turn the [22] 23 tape over for a continuation of the

[24] presentation.) .

ALLEN ROGERS: — interesting in along as

Pags 83 in what Mort said was that this great complicated Monte

[2] Carlo and computer analysis really produces a number

By which is very similar to cumulative exposure, very

[4] similar if you just took the mean of the results

g presented in the historical papers and then did your

is proportion of time. I am sorry to go to all the

m computer buffs and I am sorry to dispose of my son

m who studied computer science at the university.

by however, you get nothing — it goes to another factor ing that you really are getting not much out of a very

[11] small number.

It is interesting to see most of the (13) information provided today related to about three, if [14] not at the most four scientific papers in the us international literature.

The stuff on the laggers was all Balzer μη and Cooper. And everything that has been done and through the courts, as far as I see, relies on some [19] short 10-minute samples done a number of times in one [20] particular work location.

And the same on many of the other types of 1223 studies. The Harries study, you know, I have read [23] his thesis and everything else, but it is very small 24) amounts of numbers that people are making these 129 massive extrapolation to many millions of work -

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[1] potentially many millions of workers based on some re very short periods of exposure information.

The data that you plug into these models [4] and calculations is so limited that it makes the in variability in the final extrapolation near in impossible to determine its accuracy.

Thank you.

FRED BOELTER: I think your point is well p taken on that, and frankly there isn't that much data in out there historically pre 1970. There is a number (11) of reasons for that, it wasn't required to be 12 collected and it wasn't available, so there are a few number of places to go to gather that information.

[14] Your earlier point about using the mean us value is well taken. But my vièw on doing this type ng of a dose reconstruction is really similar to a risk in process using a tiered system. In a tier one ng analysis we can use default values, such as the is means, and determine whether that seems adequate to 201 answer the question that has been posed.

(21) If that analysis on a tier one is not p21 sufficient, and we go to a tier two where we look at more specific information, that might relate to the 124) activity or the event of interest. Absent that, we RS can go to a tier three analysis and go through all

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this process clearly.

This level of taking the work history and a timeline and slicing up individual sections to ultimately calculate a dose associated with each event can't be done on (audiotape difficulties) and rying to analogize it to the situation that we are confronted with evaluating to ultimately opine about the significance. It has its application not only in itigation but also in nonlitigation, and it is a undamental process, as Dr. Corn pointed out, in performing an epidemiologic study, but it is a echnique where when necessary we can get into the nformation and try in some way to compile a iumerical value associated with a dose, a historic lose, to determine its significance, generally in omparison to something else.

(Audiotape difficulties) JIM RASMUSON: The industrial hygienist annot be air monitoring every situation at all mes. An industrial hygienist by instinct uses nese techniques to try to prioritize exposures in ie workplace.

I think what we are trying to present here simply a formalized approach (audiotape ifficulties) only several, three or four literature

ticles were the basis for this, literally thousands our database. As Dr. Boelter mentioned, it is st a matter of time and for reasons of simplicity udiotape difficulties) at the time is almost beside e point because what we are talking about is the posure assessment process, which really deals with rrent exposures, future exposures: It is the sis, for example, setting priorities for cleaning · Superfund sites and so on, and if industrial gienists don't become more conscious of what they : doing relative to exposure assessment, I think : field will likewise suffer in the same manner as ve try to attach too much significance to the work do as well.

FRED BOELTER: Thank you. I actually took comment about the literature as being the plished literature as opposed to the tremendous ount of information that is available, the sublished literature.

IM RASMUSON: That is right. And, of rse, there is a tremendous database of unpublished nature that most of us have access to as well. RED BOELTER: There was another question? IIKE MILLER: Mike Miller from the Navy ironmental Health Center in Norfolk, Virginia.

& EXPO 2002, et al. Page 87 I attended this session because we

[2] frequently get inquiries from the Veterans m Administration about veterans who are filing ky service-connected disability claims, and the question g goes sort of like this person was a fireman in apprentice on the USS whatever from the period of m 1940 to 1942, can you comment on his exposures. And, in of course the answer to that is no. So I was fascinated to see that you [10] somehow have attached some numbers to those exposures [11] and I am just curious as to, for instance, the (12) boiler, Navy boiler tender exposure of .1 fibers per . (13) cc, where that number came from, because I am pretty 1141 sure that at least within the Navy that data doesn't usi exist and it was never collected.

You know, I am an industrial hygienist but [16] ווח I am also the son of a World War II Navy veteran who [18] died way too young of lung cancer, so my sympathies [19] are, indeed, with these veterans who deserve every penny if it is, indeed, a service-connected 21) disability, and I would love to be able to answer 122) these questions with some degree of certainty and 231 science, as Dr. Corn pointed out, but it just occurs (24) to me that the models are based on certain ps, assumptions being plugged in at the front end and,

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[1] not being a lawyer, but my supposition would be that g the assumptions are nothing more than speculation, so p) the result at the other end of the equation can be m nothing more than speculation. in I am wondering what kind of legal veracity [6] it has in a courtroom or when filing a claim? BILL DYSON: Well, obviously I do have a 181 basis for that number. There were a series of 191 studies done in the James River Reserve Fleet by [10] Illinois Institute of Technology that gave us a range [13] of numbers that went from .00X up through .3, and izi don't get hung up on the fact that I am using a

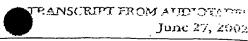
(13) single point estimate for this, that was just for [14] illustrative purposes. There are also a large series us of studies that have been done on commercial ships, [15] actual measurements that have been made, various

117 activities on commercial ships by several of the oil (18) companies; for example, and furthermore, there is

(19) actual testimony before a congressional committee by 20) a representative of the Navy who used that very same 211 number, 0.1, saying that people had not been exposed 221 above that number.

So these numbers come from a wide variety 24 of sources, they are not pulled out of the air at १२५१ मी.

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Page 89 JOHN SPENCER: I will also add I was (1) us. I really appreciate all of you turning out for in formally with the U.S. Coast Guard as their [2] this event and look forward to continuing to develop m industrial hygienist and we had a small shipyard this information. Thank you. [4] facility, albeit not the naval size shipyards, but my (Applause.) [4] (End of audiotape.) role was also working with the medical people and the [5] occupational medical monitoring program, and then [6] m also their workers' comp related issues, and we had a lot of data in the Coast Guard, and I know the Navy, [8] 134 [9] I have done foyer requests from the Navy and gotten 1101 [10] similar data on various specific activities based -[11] [11] and looking at trades and activities as to what the [12] [12] levels of exposure were when they were doing some of £131 [13] the activities that we had described here, removing [14] [14] pipe insulation or working on boilers. [15] That data is out there, and I used it when [15] [161 [16] I was with the Coast Guard in determining the levels, [17] in the overall dose and levels of exposure for Coast [18] Guard employees. [19] DOUG FOWLER: There is similar information [20] 201 available from Pudget Sound Naval Shipyard and Mare [21] [21] Island Naval Shipyard, but that information is [22] [22] typically for shipyard tasks as opposed to shipboard [23] [23] tasks, and we don't know very much about what typical [24] [24] exposures were in engine rooms, boiler rooms, and [25] 1251 other machinery spaces aboard ship. Page 90 [1] There have been a few pieces of

CERTIFICATE [2] information as studied by Jones at Illinois Institute [3] B) of Technology Research Institute is about the only STATE OF GEORGIA: [4] (4) one, and as I recall, they did one measurement - I COUNTY OF FULTON: [5] s will take it back — three measurements in a boiler [6] 7 You know, we are talking about three [8] numbers, and that is what we have to base it on I hereby certify that the foregoing [9] hearing was transcribed from tape and So there is a real paucity of information reduced to typewriting under my direction, and that the foregoing pages 1 through 91 [11] with regard to conditions aboard ships while underway represent a true, complete, and correct 12] and especially with regard to conditions in boiler transcript of said tape transcription. [14] 13] rooms while firing or receiving fire, and that kind [15] This, the 28th day of June, 2002. 14) of information is just simply not known. But there រេត 15] is a lot of information about shipyard activities. [17] FRED BOELTER: The other thing to remember [1B] in is when doing a dose reconstruction, often we are Frances Buono, CCR-B-791. in working with the information that people say that us My commission expires the in they did and drawing analogies from that, so it is 25th day of April, 2003. m not a job description of strictly a machinist mate, [20] m it is the descriptions of that individual saying what [21] 21 they did while they were performing their activities. (2Z) I am unfortunately going to have to call [23] 4) the end of this session and we will be around if you

s) have questions. Feel free to come up and speak with

room of a merchant ship underway.

m because that is all we have.

[1]

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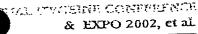
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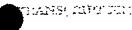
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